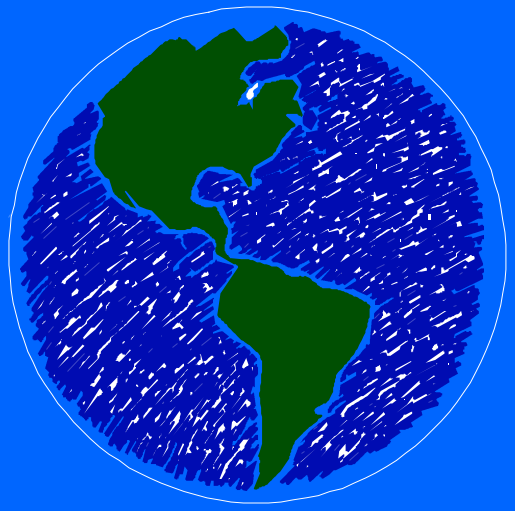
SMWG
RISK-BASED DECISION-MAKING FRAMEWORK FOR SEDIMENTS

EPA Forum on Managing Contaminated Sediments at Hazardous Waste Sites



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Presented by:
Steven C. Nadeau
Sediment Management Work Group
Coordinating Director

SMWG BACKGROUND

- Formed in 1998
- Advancing risk-based, scientifically sound approaches for evaluation of sediment management decisions
- Current membership 38 entities and growing
  - Private industry
  - Governmental PRPs
  - Research organizations
  - Industry trade associations
  - International organizations

SMWG REPRESENTATIVE INITIATIVES:

- Publication of nine technical papers
- Development of an interactive decision tree
- Technical submittals/presentations to the NAS Committee on Remediation of Contaminated Sediments
- Input and dialogue with various Federal and State Agencies developing sediment policies and guidance
- Implementation of a targeted national education program supporting a risk-based framework for sediment management decision-making
- Web page: www.smwg.org

KEY QUESTIONS - SEDIMENT MANAGEMENT EVALUATION

- Are ongoing, external sources significant and can these be readily controlled?
- Does the presence of contamination present unacceptable risk?
- Are there any readily-implementable solutions that may be initiated prior to final remedy selection that will reduce the risk posed by the sediment contamination in whole or in part?
- Will risks become acceptable via natural recovery and, if so, over what time frame?
- Can active remediation significantly accelerate the achievement of acceptable risk?

KEY QUESTIONS - SEDIMENT MANAGEMENT EVALUATION

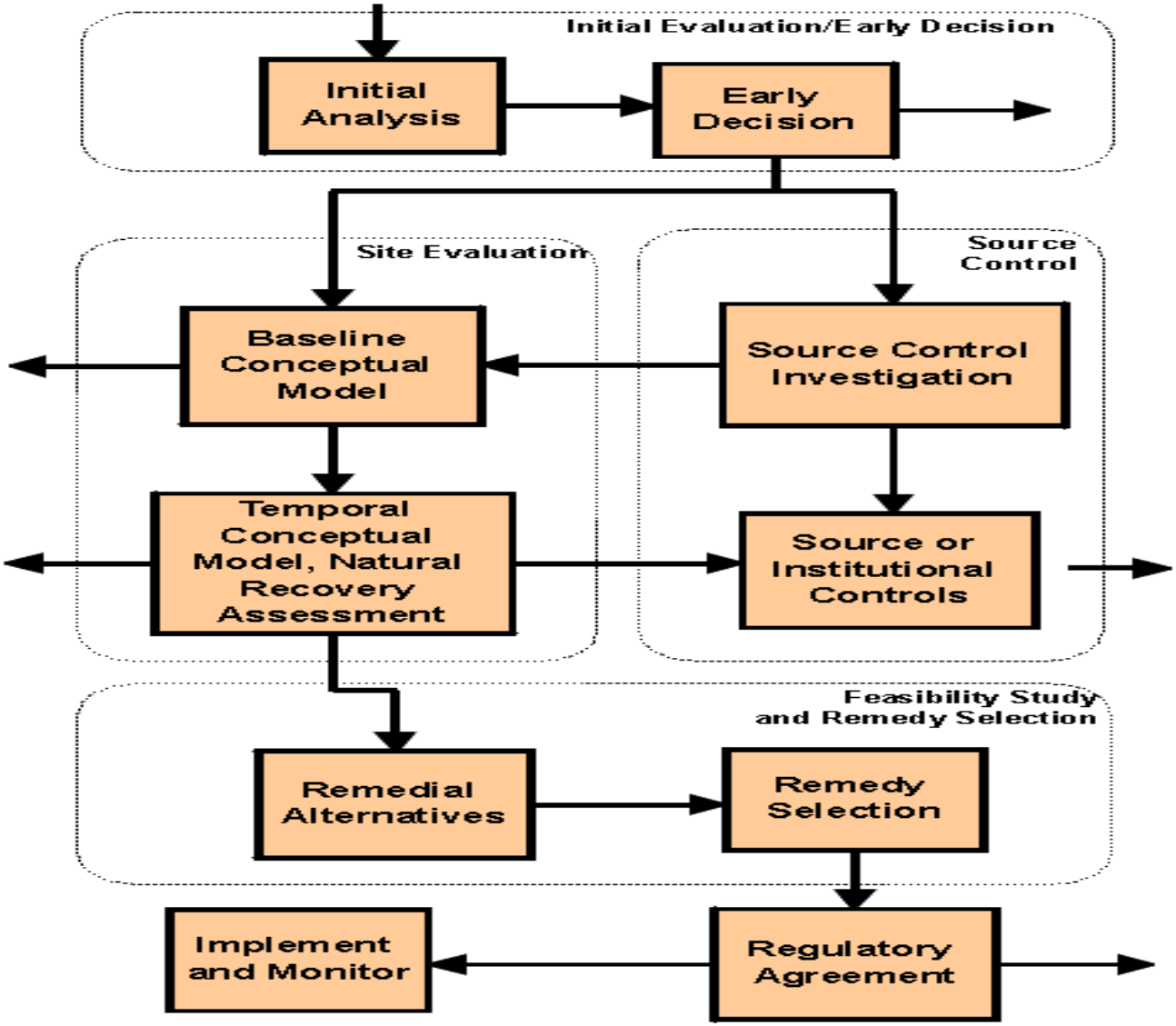
- Will rare natural events or human activity significantly disrupt conditions?
- What are all of the short term and long term risks for each option (including implementation and post-remedial risks)?
- What are the comparative risk reductions of the sediment management options under consideration?


Tools *Enable* Decision-Makers
… They Do Not *Make* Decisions

SMWG DECISION TREE

- Developed in 1999 in conjunction with a series of technical monographs on key issues in development of sound sediment management
- Intended to serve an integrating role, and to provide a practical tool to drive effective decision-making ...

Sediment Management Decision Framework



KEY ELEMENTS OF THE SMWG RISK-BASED DECISION-MAKING FRAMEWORK

- Conceptual Site Model
- Understanding of key technical issues
  - Bioavailability/bioaccessability
  - Sediment stability
- Risk management principles
- Comparative evaluation of net risk reduction
- Remedy selection

CONCEPTUAL SITE MODEL

- Definition:
  - A Conceptual Site Model (CSM) is a characterization of the key overall dynamics of the sediment site (e.g., sources, sinks, contaminant fate and transport, exposure pathways and receptors) which provides the necessary site understanding as a basis for remedial strategy development
  - A valid CSM is critical to evaluation of any sediment site
  - The CSM should incorporate risk management principles and be focused on practical resolution of the problem

CONCEPTUAL SITE MODEL

- The CSM should answer the following questions on sources, migration and pathways:
  - Setting and sediment situation
  - Degree of interaction with the surrounding watershed (especially ongoing sources and net sediment deposition)
  - Nature and extent of the contaminated sediments (including distribution and depth in the sediment column)
  - Bioaccessibility and bioavailability

CONCEPTUAL SITE MODEL

- Relevant mechanisms for contaminant flux from sediments
- Sediment stability
- Relevant pathways (human health and environment)
- Sources of unacceptable risk
- Natural processes and their roles

BIOAVAILABILITY/ BIOACCESSIBILITY

- Concept
  - Contaminants that are not within the bioavailable zone are not a source of significant exposure and risk to fish or higher organisms
  - Contaminants that are not biologically available to organisms, even though they may reside in the biologically accessible zone, are also not a source of risk

SEDIMENT BED STABILITY

- Definition
  - Ability of sediment bed to withstand erosion in response to natural or induced hydrodynamic stress
- Significance
  - In many cases past contaminant releases are sequestered within the sediment profile and overlain by clean sediments
  - Bed stability is a critical component of remedies incorporating containment of contaminants within the waterbody
  - The temporal CSM should incorporate the impact of rare events, to the extent feasible

ROLE OF RISK MANAGEMENT

- Considerations in Risk Evaluation
  - Risk management actions should be linked to reduction of key (significant) human and ecological risks
  - Management goals must be framed within a realistic time period; it is not practical to achieve all goals in the short term
  - Eco-risks should be characterized at level of assessment appropriate for site
  - Acceptable rates of natural recovery should be defined
  - All risks of the remedial options must be considered

COMPARATIVE EVALUATION OF NET RISK REDUCTION

- Definition
  - The net risk reduction potential of each of the sediment management options under consideration should be evaluated and compared on a site-specific basis
- Concept
  - Each remedial action has its own attendant risks, e.g.:
    - Implementation risks and residual concentrations associated with intrusive remedies
    - Stability issues with respect to in-situ remedies

COMPARATIVE EVALUATION OF NET RISK REDUCTION

- Risks that should be evaluated include:
  - All residuals (inside and outside remedial area)
  - Releases during the remedy implementation;
  - Releases during pre-treatment and final treatment;
  - Releases during temporary storage;
  - Releases during transportation and disposal;
  - Risks/releases at the final disposal location;
  - Risks to workers in an inherently dangerous environment.

COMPARATIVE EVALUATION OF NET RISK REDUCTION

- Any other implementation risks, such as disruption of the benthic community, impacts on fish and wildlife, and changes in flood plain configuration
- Community impacts, including: accidents, noise, odor, air emissions, disruption of use and enjoyment of the resource, disruption of residential and commercial use and enjoyment
- Long term risks

COMPARATIVE EVALUATION OF NET RISK REDUCTION

- Measurement
  - The relative risk reduction of each alternative should then be calculated and compared to the other management options under consideration
  - A complete evaluation of all risks (“cradle to grave”) must be included

REMEDY SELECTION

- The Full Array of Sediment Management Options Should be Considered in the Context of Site-Specific Circumstances, Including Innovative Approaches
- Natural Recovery Should Be Compared and Contrasted to More Active and/or More Intrusive Sediment Management Options
- Sediments Should Not Be Presumed to Be Inherently Unstable (Sediment stability should be thoroughly evaluated based on valid scientific models, calibrated where feasible with site specific information)

EFFECTIVE DECISION TOOLS

- Effective Decisions Must Consider Site-Specific Conditions … But Effective Decision-Making Tools Must Also Exhibit a “Portability” that Transcends Site Conditions
- Effective Decision-Making Tools Must be Driven to Achieve Specific Goals
  - Goals Must be Founded in Sound Science and Risk Management Principles, also Practical and Probable Future Scenarios